

Customer No.: 31561
Application No.: 10/707,081
Docket No.: 10585-US-PA

REMARKS

Present Status of the Application

Claims 1-7 remain pending of which claim 1 have been amended to more explicitly describe the claimed invention. It is believed that no new matter adds by way of amendment to claims or otherwise to the application. Specifically, amendment of claim 1 is fully support by figures 1B, 2A and 3A. In figures 1B, 2A and 3A, there is no patterned photoresist layer formed on the dielectric layer 110, and obviously, the high molecular weight residues 114 still exist after the patterned photoresist layer is removed.

In the Office Action, claims 1, 6 were rejected under 35 U.S.C. 102(b) as being anticipated by Lin et al. (U.S. Patent No. 5,989,997); claims 2-5 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Patent No. 5,989,997); and claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Patent No. 5,989,997) in view of Chooi et al (U.S. Patent No. 6,566,260).

Discussion of Office Action Rejections

1. The Office Action rejected claims 1, 6 under 35 U.S.C. 102(a) as being anticipated by Lin et al. (U.S. Patent No. 5,989,997). Applicants respectfully traverse the rejections for at least the reasons set forth below.

Independent claim 1 recites the features as follows:

1. A cleaning method used in an interconnect process, comprising the steps of:

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providing a substrate having a conductive layer and a dielectric layer formed thereon, wherein the conductive layer is formed over the substrate and the dielectric layer is formed over the conductive layer;

patterning the dielectric layer to form an opening by forming a patterned photoresist layer on the dielectric layer, wherein a portion of the conductive layer is exposed by the opening;

removing the patterned photoresist layer; and
cleaning the opening after removing the patterned photoresist layer
by using a mixture containing sulfuric acid and hydrogen peroxide in water.

(emphasis added).

Claim 6 also recites the similar features.

In U.S. Patent No. 5,989,997, Lin et al. disclosed a method for forming dual damascene structure. The disclosure discussed by Lin et al. is illustrated as below.

— First, as shown in FIG. 3A, a substrate 130 having patterned metallic layers 131 formed thereon is provided. Then, a dielectric layer 132 is formed over the substrate 130, and the dielectric layer 132 is planarized so that its thickness is the necessary height for forming a vertical plug. (See Column 4, lines 1-4)

-- In the subsequent step, using conventional photolithographic and etching processes, the dielectric layers 132, 133 and 134 are patterned to form a vertical window 136 exposing a portion of the metallic layer 131 in the substrate 130. (See Column 4, lines 26-30)

— Consequently, a residual photoresist layer 138b will remain at the bottom of the vertical window 136 after subsequent development. (See Column 4, lines 53-55)

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-- Because there is a protective residual photoresist layer 138b above the metallic layer 131, damages to the metallic layer 131 when the dielectric layer 134 is patterned to form the horizontal trench 142' is reduced to a minimum. (Column 5, lines 17-21)

-- Next, as shown in FIG. 3D, the photoresist layers 138a and 138b are removed, for example, by a wet etching method using oxygen plasma or a solution composed of sulfuric acid, hydrogen peroxide, and ammonium hydroxide. (See Column 4, lines 22-25)

After studying Column 4, lines 22-25 of U.S. Patent No. 5,989,997, Applicant assert that oxygen plasma or a solution composed of sulfuric acid, hydrogen peroxide, and ammonium hydroxide is used to remove the photoresist layers 138a and 138b. Specifically, the solution composed of sulfuric acid, hydrogen peroxide, and ammonium hydroxide disclosed by Lin et al. are "NOT" used to clean the opening. In other words, one skilled in the art would interpret the solution composed of sulfuric acid, hydrogen peroxide, and ammonium hydroxide disclosed by Lin et al. as a photoresist stripper rather than a cleaning solution used in cleaning process. Accordingly, the disclosure of Lin et al. is not read on claim 1.

Additionally, since claim 6 recites similar features as recited in claim 1, claim 6 is also distinguished from prior art (U.S. Patent No. 5,989,997) and is in proper condition for allowance.

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2. The Office Action rejected claims 2-5 under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Patent No. 5,989,997). Applicants respectfully traverse the rejections for at least the reasons set forth below.

In re U.S. Patent No. 5,989,997 and US 2003/0116534, both Lin et al. and Chen et al. fail to disclose that the mixture containing sulfuric acid and hydrogen peroxide in water can be used to clean the opening after removing the patterned photoresist layer. Therefore, the fabricating method recited in claims 2-5 are not obvious to one skilled in the art and in proper condition for allowance.

3. The Office Action rejected claim 7 under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Patent No. 5,989,997) in view of Chooi et al (U.S. Patent No. 6,566,260). Applicants respectfully traverse the rejections for at least the reasons set forth below.

In re U.S. Patent No. 5,989,997 and U.S. Patent No. 6,566,260, both Lin et al. and Chooi et al. fail to disclose that the mixture containing sulfuric acid and hydrogen peroxide in water can be used to clean the opening after removing the patterned photoresist layer. Therefore, the fabricating method recited in claim 7 is not obvious to one skilled in the art and in proper condition for allowance.

For at least the foregoing reasons, Applicant respectfully submits that claims 1-7 are in proper condition for allowance. Reconsideration is respectfully requested.

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CONCLUSION

For at least the foregoing reasons, it is believed that all pending claims 1-7 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

Date :

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Respectfully submitted,



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